WHAT IS CLAIMED IS:

1. (previously presented): A spin valve sensor for producing a giant magnetoresistive (GMR) effect on a sense current, which travels in a longitudinal direction, in response to applied magnetic fields, the sensor comprising:

a first ferromagnetic free layer having a magnetization (M_1) in a first direction that is aligned in the longitudinal direction when in a quiescent state;

a second ferromagnetic free layer having a magnetization (M_2) in a second direction that is anti-parallel to the first direction when in a quiescent state;

a spacer layer between the first and second ferromagnetic free layers; and

a permanent magnet positioned above the first and second ferromagnetic free layers opposite an air bearing surface (ABS) and producing a bias magnetic field that biases both M_1 and M_2 in a third direction that is transverse to the first and second directions thereby establishing quiescent bias states for M_1 and M_2;

wherein M_1 and M_2 rotate about their quiescent bias states in response to an applied magnetic field.

2. (previously presented) The spin valve sensor of claim 1, including an insulating layer between the permanent magnet and the first and second ferromagnetic free layers.

3. Cancelled.

4. (original): The spin valve sensor of claim 1, wherein the third direction is selected from a group consisting of downward and upward.

5. (previously presented): The spin valve sensor of claim 1, including first and second contacts respectively positioned in contact with first and second ends of the first and second ferromagnetic free layers and the spacer layer, wherein the sense current is configured to flow between the first and second contacts in the longitudinal direction.

6. (previously presented): The spin valve sensor of claim 5, including:

a bottom shield proximate the first ferromagnetic free layer and the contacts; and

a top shield proximate the second ferromagnetic free layer and the contacts.

7. (previously presented): The spin valve sensor of claim 1, wherein M_1 and M_2 are oriented in a direction that is about 45° relative to the sense current when in their quiescent bias states.

8. (original): A data storage system including a spin valve sensor in accordance with claim 1.

9. (previously presented): A method of sensing an applied magnetic field, comprising steps of:

(a) providing a first ferromagnetic free layer having a magnetization (M_1) in a first direction that is aligned with a sense current (I) in a longitudinal direction, when in a quiescent state;

(b) providing a second ferromagnetic free layer having a magnetization (M_2) in a second direction that is anti-parallel to the first direction, when in a quiescent state;

(c) applying a bias magnetic field to the first and second ferromagnetic free layers with a biasing component thereby angling M_1 and M_2 toward a third direction that is transverse to the first and second directions and establishing a quiescent bias state, wherein the biasing component is either a permanent magnet positioned above the first and second ferromagnetic free layers opposite an air bearing surface, or a first anti-ferromagnetic layer exchange coupled to the first ferromagnetic free layer and a second anti-ferromagnetic layer exchange coupled to the second ferromagnetic free layer; and

(d) allowing M_1 and M_2 to rotate about their quiescent bias states in response to an applied magnetic field.

10. Cancelled.

11. (previously presented): A spin valve sensor for producing a giant magnetoresistive (GMR) effect on a sense current, which travels in a longitudinal direction, in response to applied magnetic fields, the sensor comprising:

a first ferromagnetic free layer having a magnetization (M_1) in a first direction that is aligned in the longitudinal direction when in a quiescent state;

a second ferromagnetic free layer having a magnetization (M_2) in a second direction that is anti-parallel to the first direction when in a quiescent state;

a spacer layer between the first and second ferromagnetic free layers;

a biasing component including a first anti-ferromagnetic layer exchange coupled to the first ferromagnetic free layer and a second anti-ferromagnetic layer exchange coupled to the second ferromagnetic free layer, the

first and second anti-ferromagnetic layers each producing a bias magnetization field that respectively biases M_1 and M_2 in a third direction that is transverse to the first and second directions thereby establishing quiescent bias states for M_1 and M_2; and

wherein M_1 and M_2 rotate about their quiescent bias states in response to an applied magnetic field thereby producing a GMR effect in the sensor as a function of the rotation of M_1 and M_2.

12. (previously presented): The spin valve sensor of claim 11, wherein the third direction is selected from a group consisting of downward and upward.

13. (previously presented): The spin valve sensor of claim 11, including first and second contacts respectively positioned in contact with first and second ends of the first and second ferromagnetic free layers and the spacer layer, wherein the sense current flows between the first and second contacts in the longitudinal direction.

14. (previously presented): The spin valve sensor of claim 13, including:

a bottom shield proximate the first ferromagnetic free layer and the contacts; and

a top shield proximate the second ferromagnetic free layer and the contacts.

15. (previously presented): The spin valve sensor of claim 11, wherein M_1 and M_2 are oriented in a direction that is about 45° relative to the sense current when in their quiescent bias states.

16. (previously presented): A data storage system including a spin valve sensor in accordance with claim 11.

17. Cancelled.

18. Cancelled.

19. Cancelled.

20. Cancelled.

21. Cancelled.

22. Cancelled.

23. Cancelled.

24. Cancelled.